Claims

1. A method of improving a grating design function describing a refractive index variation defining a multi-channel grating structure in a waveguide material, the improvement being a reduced maximum refractive index variation in the waveguide material along the grating structure while maintaining a desired functional spectral domain in a spectral response function associated with the design function, the method comprising the steps of:

- modifying a first design function to generate a second design function having a reduced maximum amplitude compared with the first design function,

- determining a second response function associated with the second design function,

- modifying the second response function to create a third response function having a desired functional spectral domain, and

- determining a third design function associated with the third response function,

and iterating the method steps until the desired improvement is achieved, wherein the third design function of the previous iteration takes the place of the first design function of the next.

2. A method as claimed in claim 1, wherein the step of modifying the second response function comprises replacing the corresponding spectral domain of the second response function by the desired functional spectral domain.

3. A method as claimed in claims 1 or 2, wherein the desired functional spectral domain comprises a corresponding spectral domain of a first response function associated with the first design function.

4. A method as claimed in any one of the preceding claims, wherein the method comprises the pre-iteration step of determining the first design function from a or the associated first response function.

5. A method as claimed in any one of the preceding claims, wherein the determining of the response functions from the design functions comprises solving a direct scattering problem, and the determining of the design functions from the response functions comprises solving an inverse scattering problem.

6. A method as claimed in any one of the preceding claims, wherein the step of modifying the second response function to create the third response function is conducted in a manner such that the third response function has a desired response characteristic in at least one spectral domain other than the functional spectral domain.

7. A method as claimed in claim 6, wherein the step of modifying the second response function comprises replacing the corresponding at least one spectral domain with the desired response characteristic.

8. A method as claimed in any one of the preceding claims, wherein the step of modifying the first design function comprises applying a normalisation process or an averaging process to the first design function.

9. A method as claimed in claim 8, wherein the normalising process comprises replacing an amplitude function $\kappa(z)$ of the design function by a product of the square root of a constant A and a corresponding single-channel seeding amplitude function $\kappa_s(z)$, while maintaining a phase function of the design function.

10. A method as claimed in claim 9, wherein the constant A is defined by a normalisation condition.

11. A method as claimed in claim 10, wherein A is defined by the normalisation condition $A = \int_0^l \kappa^2 dz \,/\, \int_0^l \kappa_s^2 dz$, where l is a length of the multi-channel grating structure.

12. A method as claimed in claim 8, wherein the averaging process comprises averaging over a sampling or quasi-sampling period of the design function.

13. A method as claimed in any one of claims 8 to 12, wherein the normalising or averaging processes is complimented or replaced by a nonlinear transform reshaping operation, which reduces $\kappa_{max}(z)$ while keeping the parameter $\int_0^l \kappa^2 dz$ substantially unchanged.

14. A method of fabricating a multi-channel grating structure, the method comprising the step of improving a grating design function describing a refractive index variation defining the multi-channel grating structure in a waveguide material as claimed in any one of the preceding claims.

15. A multi-channel grating structure fabricated utilising a method of fabrication as claimed in any one of the preceding claims.

16. A method of improving a grating design function describing a refractive index variation defining a multi-channel grating structure in a waveguide material, substantially as herein described with reference to the accompanying drawings.

17. A method of fabricating a multi-channel grating structure, substantially as herein described with reference to the accompanying drawings.

18. A multi-channel grating structure, substantially as herein described with reference to the accompanying drawings.